ISO STANDARDIZATION

Zone model for the **offshore wind industry**

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The relevant technical committee of the International Organization for Standardization (ISO) has adopted a working draft for standardization of a new zone codification model for offshore wind energy farms. The model was designed as part of a bachelor's degree dissertation submitted to the Lübeck University of Applied Sciences and prepared in close collaboration with the working groups of DIN's Shipbuilding and Marine Technology Standards Committee in Hamburg.

→ The development of offshore wind energy requires the collaboration of many different stakeholders who so far have had little to do with each other. The new zone model uses an assignment to zones (underwater, onshore, seabed, sea surface, air) and parameters (object properties, object function, system level and system variant) as well as a reference number to uniquely address and locate an entire wind turbine. This is the necessary communication basis for all the partners involved.

A solution: standardization?

It is an unwritten law of the last almost 100 years that successful industrialization can only be achieved through standardization and harmonization. Based on this assumption, the standardization activities for offshore wind energy relating to marine technology have been bundled at the Shipbuilding and Marine Technology Standards Committee (NSMT) in Hamburg. NSMT agreed to act as the secretariat of the respective working group at the ISO in order to secure the interests of the German industry at the earliest possible stage. Committee NA 132 02.12. AA Offshore Wind Energy commenced work in 2011. Working groups were formed and most of the standardization plans of the ISO were mirrored by German committees.

However, the working groups formed were far from homogenous. Instead, two worlds collided: on the one hand, the companies from the maritime technology sector with vast expertise in construction in accordance with the guidelines of classification societies and the pertinent standards; on the other hand, the companies of the wind energy industry with their specific experience in the construction of onshore wind farms. One of the aims of NSMT is to unite this diverse technical know-how and thus enable new, standardized and therefore more efficient processes. However, in the first year of its existence, the standardization committee Offshore Wind Energy was not able to find a common language all the partners could agree on.

Heated debates over terminology were held in the working groups, without achieving any long-term documented compromises. The communication between the working groups proved to be equally problematic. A so-called zone model was discussed in several working groups, and although the external framework was more or less the same, there were seemingly insurmountable differences in the terminology regarding the individual zones.

A zone model

One of the first topics on the agenda was the creation of a zone model that would make it possible to identify the objects of an offshore wind farm. Various proposals were put forward in this connection, some were even fully developed. Nonetheless it became evident that the result was not as universally practical as everyone had hoped. This is well documented in the minutes of a meeting of committee NA 132-02-12-06 AK "Working and living conditions", in which this committee accepted only the first zone model as being valid. When the first concrete working draft was presented, they decided against using the zone model. The question is whether such a model has any future at all. →

MATRIX STRUCTURE OF THE ZONE MODEL

Object property:	Zones:				
	AIR **Air**	**ONS** **Onshore**	**SSF** **Seasurface**	**UDW** **Underwater**	**SBD** **Seabed**
-1 **movable**	AIR-1 e.g. aerial vehicles	ONS-1 e.g. road vehicles	SSF-1 e.g. vessels	SUB-1 e.g. submarines, divers	SBD-1 e.g. RUV/AUV
-2 **stationary/ permanent**	AIR-2 e.g. platforms, wind turbines	ONS-2 e.g. buildings	SSF-2 e.g. platforms, wind turbines	SUB-2 e.g. bearing structure under the waterline	SBD-2 e.g. base structure, cables, hoses
-3 **temporary**	AIR-3 e.g. rope accesses	ONS-3 e.g. accom-modation containers	SSF-3 e.g. jacked-up installation vessel	SUB-3 e.g. legs of the jacked-up installation vessel	SBD-3 e.g. feet of the jacked-up installation vessel

The object zone model

In order to explain why this model can only work to a very limited extent, here is a brief description:

→ The most important objects in a wind farm are assigned a zone code. Some objects are even assigned more than one. For example, a vessel has the designation "Zone 7". However, in this model, a wind turbine consists of the zone "underwater", the tower, the nacelle and the rotor.

A platform, on the other hand, consists of only two zones. While the lines between the turbines are not taken into consideration at all, a jack-up vessel that is only ever located in the wind farm temporarily is also assigned its own zone.

On closer inspection, the weaknesses of the object zone code soon become obvious. Objects present only temporarily or yet to be erected are declared as zones. So, particularly when creating a representation of the operations within a virtual operation model, this will always lead to several data modules being empty. Only during a very short space of time, the construction phase, will there be complete sets of data, but only at that moment in time when at least one complete wind turbine and, at the same time, one platform have been installed. It becomes equally problematic when further technical innovations currently not defined in the model are introduced as this would require extending the current model. Its complexity would thus increase, because new additions cannot be adopted in the model.

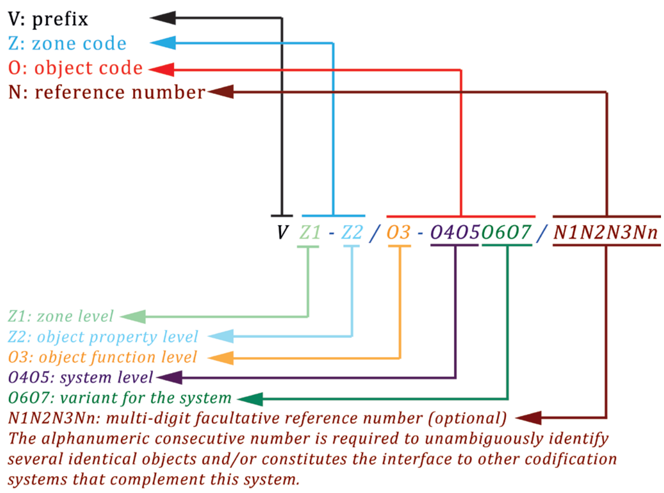
New approach

It quickly became clear that a different approach was needed. In a working group meeting, a proposal was made to create a matrix with which the objects could be designated and referenced according to their spatial location in the natural environment (air, land, water or underwater). Next, the dynamic property of the object creates the second descriptor level. Therefore, the matrix makes it possible not only to describe any object uniquely but also to describe it in relation to its respective location of operation. The newly created structure therefore leads to the first code element, the zone code.

To achieve the aforementioned aim, namely to identify an object uniquely in a wind farm, further descriptor levels are required. One of these is the object code. This describes an object according to its function. The object code likewise consists of two levels. The first level examines the function of the object, i.e. whether the object is used for the production of energy, the transformation of energy, the transport of energy, maintenance or construction purposes or whether it is special equipment. The second level codifies the highest hierarchical level of a technical system. However, to uniquely differentiate it, an additional system variant can also be codified.

Furthermore, a reference number is added so that similar turbines can likewise be uniquely identified. The initial idea for this reference number is to use it to include the designation stated in the blueprints and on the actual turbines. For example, for a wind turbine in the "Alpha Ventus" test field could be assigned the reference number AV09, if this is the wind turbine in question. Since the reference number can consist of any numbers or letters, it has even more potential. For instance, one could also assign geodetic coordinates for navigation purposes, if required. Furthermore, another possibility would be to use the reference number as a link to other descriptive code systems. The zone model is restricted to the codification of larger objects, i.e. the highest hierarchical level. Quite deliberately, not every single cable or every single switch in the wind farm is codified. There already exist codification systems for such applications that are potentially better suited to describing such parts, but have weaknesses on the highest level.

RESULTING DATA MODULE OF ZONE AND OBJECT CODE



Strengths of the zone model

The zones are defined by the elements of the natural environment. The elements have a big advantage in that they are always available. Possible incongruities that could result from non-existing zones as a result of temporary objects are thus avoided. The sub-zones are defined by the object's property. Therefore, the sub-zone is already the first object level. The elementary zone model thus offers an elegant way of always recording every single object in every operating state, because it is more or less infinitely extendable. Regardless of any newly arising technical necessities or technical equipment, only the property of the object is verified and then assigned to the relevant zone and sub-zone according to this property. By using this process, the zone model retains its simple structure but can at the same time adopt as many objects as needed (vertical scalability).

Another important factor is that the resulting nomenclature can be extended. To identify an object, further groups of numbers can be added that always originate from within the zone (horizontal scalability).

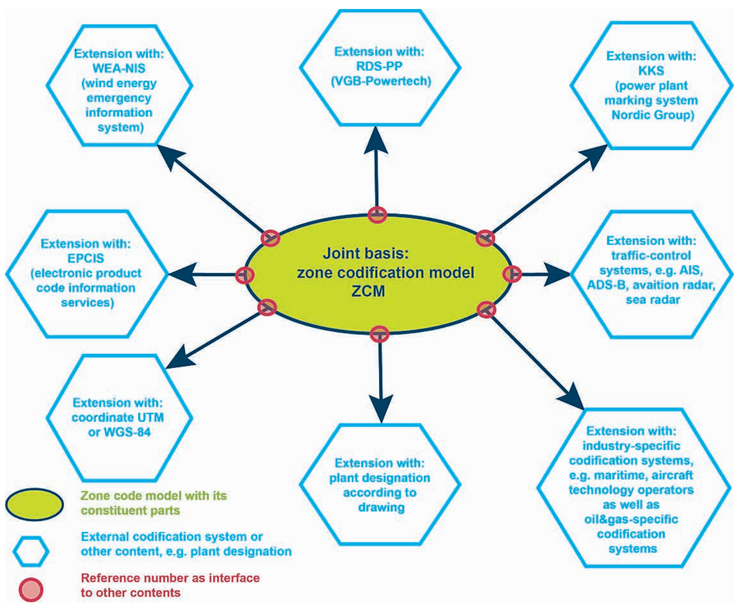
Future outlook

The current zone model has been discussed and improved in many working group meetings. The respective draft standard has been translated into English and presented to the international experts attending the latest ISO TC8/WG3 "Special Offshore Constructions and Supply Vessels" meeting in Hamburg. The feedback to this proposal was very positive. As one of the basic standards on the subject of offshore wind energy, the working draft was assigned its own number (ISO/WD 29401), which in view of the limited range of numbers can be seen as a significant indication for future consultations.

Developing the zone model and its potential realization as an ISO standard is just one part of what lies ahead for the members of the Offshore Wind Energy committee. What is equally important is creating the subsequent draft standards based on the zone model. Only if these also actually make use of the model can its potential be fully utilized. Moreover, vast potential lies in the field of emergency management.

When people work at sea or off the coast, the question as to how the workers can be evacuated or rescued in an

CONTRIBUTION OF THE ZONE CODIFICATION MODEL TO FUTURE STANDARDIZATION WORK IN THE OFFSHORE WIND ENERGY SECTOR



emergency situation is of utmost importance. Due to the distance of the turbines from the coast and also between the turbines and a platform, one can assume that rescue teams will only reach the site after a lengthy period of time. This is why great emphasis must be placed on the emergency call. If in the emergency call the location is codified according to this model, even fragments of the call can already narrow down the correct location. The designations chosen for the zones and objects are easy to memorize and can be learnt in a very short space of time. This diversification of the system enables the emergency call centre to select the correct rescue aids, based purely on the codified location. For example, if the location is a tower in Section 3, it needs to send high-angle rescuers. If the accident occurs in the nacelle, a helicopter can be used. By carrying out advance examinations of the location and by already having emergency plans in place, valuable time can be saved in an emergency situation. Without the zone codification model, this would not be possible to such an extent, because the emergency call would become far too detailed to attain the same efficiency.

The system enables short emergency calls and the codification with its easy-to-memorize symbols for the location allows a pre-selection of rescue equipment and thus saves valuable time.

The structure of the future basic standards for the technical equipment of a wind turbine and of platforms will be based on the zone model. There is vast potential in conjunction with the specific application standards, because the application guidelines only need to be defined for zones and/or systems. Any components that have this codification constituent automatically fall under these guidelines.

Economic use

The economic use of the zone model has two dimensions. The first dimension is the prospect of achieving substantial simplifications in processes if the model is consistently applied. In this process, the zone model is a building block that can provide significant tools, in particular in the intercommunication between the company and all the service providers involved. In this connection, it is essential that the parties involved understand each other. The zone model offers a mutual language for that.

The second dimension is the dissemination of technological know-how. Precisely this know-how, if made available to a wide range of stakeholders, enables sustainable economic growth through increased productivity.

Contributing to further standardization

In the beginning, the German working groups of the Offshore Wind Energy standardization committee had to overcome the same hurdle: finding a way of creating a basic scheme that, firstly, uniquely defines the terminology and objects and, secondly, provides the basis for a common project language for all the working groups involved.

The zone codification model thus makes a substantial contribution to solving both aforementioned problems. On the one hand, a common code makes up an important part of standardization. Here, standardization = cost reduction. On the other hand, the model creates a common project language, which attains added weight through the international draft standard.

At the same time, the model is structured so flexibly that future innovations can easily be integrated into it. However, the most important result of the model is that by publishing it as an international standard, technological know-how can very quickly be made available to a broad range of users and countries. In the ideal case, this will lead to global standardization and thus to worldwide interoperability.

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